in the feces. The table gives in order the frequency of infestation with each of the parasites and ova.

Nematode.	Number infested.	Per cent infested.
Hookworm	152	25.4
Trichuris	44	7.3
Ascaris lumbricoides	38	6.3
Strongyloides	24	4.0
Total	258	43.0

An average of 1.2 examinations per person were made.

Twenty patients were found to be infested with more than one kind of parasite, and one had a triple infestation.

Where specially requested, examination was made for amebic dysentery; seven men were found who were infected. Only fresh material was examined in these cases.

Stiles [1] found, in connection with the amebiasis survey on 8028 persons, that nematode infestation occurred as follows:

Nematode.	Number infested.	Per cent infested.
Hookworm	321	3.9
Trichuris	170	2.1
Ascaris	89	1.1
Strongyloides	15	0.2
Total	595	7.3

It must be remembered, however, that these 8,028 persons represented 23 States; whereas, as has been stated, the admissions to this hospital come from practically 7 Southern States.

In spite of the extensive work which has been done to eradicate hookworm infestation in the South, there is still further need for treatment of existing infestations and prevention of the spread of this condition.

SUPPLYING DRINKING WATER ON TRAINS OPERATING IN INTERSTATE TRAFFIC.

SANITARY CONDITIONS UNDER WHICH DRINKING WATER IS BEING SUPPLIED ON TRAINS OPERATING IN INTERSTATE TRAFFIC, AT THE RAILROAD COACH YARDS IN CHICAGO AND OTHER TERMINAL CITIES.

By ARTHUR E. GORMAN, Assistant Sanitary Engineer, United States Public Health Service.

The protection of the traveling public from contagious and infectious diseases requires untiring and constant vigilance on the part of the health officer. One of the most important matters which must receive this attention is the drinking-water supply.

[1] Annual Report of the Surgeon General of the Public Health Service of the United States for the fiscal year 1921. Page 93.

Sections 19, 20, and 23 of the Interstate Quarantine Regulations of the United States, revised edition, May, 1921, promulgated by the Secretary of the Treasury pursuant to the act of Congress approved February 15, 1893, and upon the recommendation of the Surgeon General of the United States Public Health Service, regulate drinking-water supplies on interstate carriers. These regulations require that water supplied for drinking and culinary purposes by common carriers shall be from a source certified and approved as producing water of satisfactory sanitary quality and safety; forbid the use of common drinking cups; and require that water which is cooled shall be cooled in such a manner that ice can not come in contact with the water. There is need for careful handling of the water in filling the coolers in the coach yards and at stations en route, if the traveling public is to be protected.

The writer has visited the 13 coach yards in Chicago (representing 21 different railroads) where each day an average of 725 coaches, 550 parlor and sleeping cars, 100 diners, and 250 mail and baggage cars are cleaned and the water coolers filled and iced. He has also recently visited the coach yards in other terminal cities of the Middle West. The following table is a summary of the cars watered in the Chicago coach yards in an average day compiled from information supplied by coach-yard foremen.

Coach yard.	Railroad.	Coaches.	Pullman.	Diners.	Mail and baggage.	Total.
Pennsylvania	Pennsylvania	45	65	10	12	132
Burlington	Burlington	50	27	12	10	99
Santa Fe	Santa Fe	18	32	7	7	64
Illinois Central	Illinois Central	45	35	5	9	94
Do	Big Four	(1)	15	2	(1)	17
Do	Michigan Central	(1)	45	6	(1)	51
Chicago, Milwaukee & St. Paul.	Chicago, Milwaukee & St. Paul.	100	35	8	10	153
Chicago & North Western	Chicago & North Western	123	85	17	64	289
Baltimore & Ohio	Baltimore & Ohio	50	18	3	18	89
Do	Great Western	30	8	2	11	51
Do	Pere Marquette	35	3	1	14	53
New York Central	New York Central	62	61	10	9	142
Rock Island	Rock Island	32	26	5	27	90
Chicago & Eastern Illinois	Chicago & Eastern Illinois	43	25	3	7	78
Chicago & Western Indiana.	Chicago, Indianapolis & Louisville.	16	14	4	12	46
Do	Wabash	28	13	3	7	51
Do	Chesapeake & Ohio	4	1	0	3	8
Do	Erie	11	3	0	8	22
Do	Grand Trunk	17	7	2	13	39
New York, Chicago & St. Louis.	New York, Chicago & St. Louis.	6	2	1	7	16
Chicago & Alton	Chicago & Alton	12	22	4	20	58
Total		727	542	105	268	1,642

[1] Included in Illinois Central yard total.

During these visits special attention was given to studying the conditions and practices in these yards with reference to the sanitary condition of the drinking water supplied the trains. Information was also obtained relative to the labor cost of sterilizing, icing, and

watering coolers, and some interesting facts have been determined from the figures submitted.

By no means the least encouraging thing revealed by these visits was the fact that the railroad companies in nearly every instance were making an honest effort to meet the requirements of the quarantine regulations. The yard and coach foremen in most of the yards visited seemed to appreciate the importance of careful handling of drinking water and were making a sincere effort to enforce sanitary practices as they understood them. Some of the practices noted were insanitary; and not infrequently in the very process of "sterilizing" coolers, the coolers were actually exposed to contamination. On the other hand, however, in several of the yards especially commendable practices were noted. The various devices being used in the different yards for saving time and improving sanitary conditions for handling water coolers clearly indicated the attention the railroad employees are giving to this important public-health matter.

A comparison of the cost figures for sterilizing, watering, and icing water coolers on cars in the various coach yards showed that in those yards where sanitary conditions with reference to these practices were the best, the work was usually being done the cheapest.

Assuming that the water supply used is of satisfactory quality and safety and is kept separate from the ice in the cooler, if the latter is clean and the water is delivered from the hydrant to the cooler without being contaminated, the traveling public should be insured a good drinking-water supply. But in actual practice the icing, cleaning, and watering of coolers bring into effect the human equation, with which the health officer must always reckon. Education and eternal vigilance are the factors of this equation as a function of public-health problems.

With reference to a safe water supply, by far the most dangerous filth common to coach yards is the fecal matter apparently dropped from the toilets of cars. These deposits are altogether too common in most coach yards and indicate a lack of attention on the part of trainmen to flushing toilets and locking the doors when the trains enter a zone within the city limits. The use of these toilets by yard trainmen and other employees should be strictly forbidden. Eliminate this filth and a big factor in jeopardizing the drinking water supplied cars in the coach yards will be removed.

For obvious reasons several of the coach yards in Chicago are located at some distance from the stations. They are of two types, described here as "through" and "terminal" yards. The former type of yard can be entered from either end by ladder tracks, and is usually intersected by one or more crosswalks. The latter type has but one terminal crosswalk, at the end of the tracks. (See Pl. I, A and B.)

Crosswalks and walks between pairs of tracks are of wood, brick, or concrete construction. The wood platforms are by no means as neat or easy to keep clean as the others and harbor large numbers of rats, especially in the winter months, because of the warmth of the steam lines usually laid under them. These rats seek food in the garbage from dining cars, the freight cars, and warehouses near by, and are responsible for considerable damage to cars. On the other hand, the brick and concrete platforms, when properly constructed, are easily cleaned. When provided with gutters on each side, excellent drainage for wash water so freely used in coach yards is afforded. (See Pl. II, A and B.)

The location of water hydrants in coach yards is a feature of design which has been too frequently overlooked or disregarded altogether. These hydrants serve principally to supply water for washing cars and for watering coolers. They are usually spaced about 100 feet apart, between each or every other pair of tracks. For safety purposes and to prevent freezing in winter, it is necessary that these hydrants be as near the ground as possible. For health reasons it is better that these hydrants should be above ground, especially when they are located at the side of the tracks or platforms and are exposed to filth dropped from the cars. By locating the hydrants in the center of the platform and near the ground, the above requirements will be fulfilled. Unless proper provision is made for drainage, mosquito breeding in water collecting in catch basins in coach yards may be prolific. This matter of drainage is especially important in the South (see A, Pl. II, and A, Pl. III).

The probability that filth dropped from trains will pollute directly the threaded nipple of a hydrant to which the water hose coupling is attached and then contaminate the water passing through the hose is small; but when the routine movements of an employee in watering tanks and coolers on trains is noted carefully, the danger of contaminating drinking water delivered to the coaches from hydrants located on the ground, near the edge of platforms or along the side of the tracks, is quite apparent.

Water tanks are filled from a hydrant either direct through a hose or from pails filled from these hydrants direct or through a hose (see Pl. III, B). These hose are usually heavy garden hose, varying in length from 50 to 150 feet, and have at one end an outside hose coupling. Provisions for the other end vary in the different yards, the majority visited in Chicago having no nozzle attachment at all. In some yards a short nipple is inserted in the free end of the hose, with or without "cut-offs." In one yard in particular two quite elaborate nozzles with different devices for protecting same were seen. In coach yards where no nozzles are fitted to the free end of the hose the water is frequently "cut off" by bending the end of the hose back on itself.

This practice, continued for a little while, soon loosens the fiber of the hose at the end and makes it ragged.

In going from train to train, in watering the cars, the hose is invariably dragged about the yard. The practice of taking the hose at its mid length, looping it over the shoulder, and dragging the two ends on the ground was noted in many of the yards in Chicago. One can readily see the grave danger of dragging the ends of the hose through the filth in the coach yard and appreciate the well-nigh impossibility of washing this filth off the ragged end by any ordinary rinsing process. Nevertheless, the free end of this ragged hose is inserted into the drinking water supply tanks anywhere from 6 to 36 inches. Where hydrants are located along every other walk only, the water hose is often thrown under cars to the next platform, and thus exposed to filth between tracks.

There is still another practice common in coach yards which is likely to result in the contamination of the drinking-water in car coolers. Even assuming that the employee engaged in watering cars is instructed to carry the ends of the hose in his hands when dragging it about the yard, as soon as he proceeds to attach the hose to the hydrant he invariably drops the free end (soon to be inserted in the drinking-water tank) carelessly to the ground. When the hydrants are located at the side of a platform, where deposits from trains are most likely to be dropped, the end of the hose is frequently seriously contaminated by this action.

Certainly the opportunities for contaminating a safe drinking-water supply, as described above, are by far too great to warrant the continuance of these practices, especially when effective remedial measures can be cheaply and quickly applied. A smooth steel nozzle with a cut-off valve would eliminate the worn and ragged hose end and reduce to a minimum the possibility of the introduction of filth into the water tanks from this now common source. It is believed that a straight bore nozzle or a 6 to 8 inch nipple inserted in the end of the hose and held in place by a tight band around the latter would be entirely satisfactory for this purpose. The ordinary hose nozzle would not be as satisfactory because, being tapered to a small orifice at the end, the water pressure would be too great for convenient work. A nozzle heavily nickel plated is much easier to rinse than one of ordinary black iron. In order (1) to make it more convenient for the workman to drag the hose about the yard, and at the same time allow him the freedom of both hands in attaching one end to the hydrant, and (2) to eliminate the necessity of dropping the free end to the ground, a strap loop could be attached to each end of the hose. A 10-inch loop would be quite sufficient for this purpose. In lieu of a strap, a strong rope could be used. The nozzle and strap attachment proposed are not original with the writer, but were suggested from observations in a coach yard in Chicago.

The cleaning of water coolers at least once a week while in use is deemed advisable. In all of the Chicago yards sterilization was being attempted by exposing the coolers to the action of live steam for periods ranging from 10 seconds to 1½ minutes. Obviously the shorter period would be insufficient for effective sterilization. Little, if any, experimental work has been done to determine a reasonable period for exposing coolers to action of live steam for efficient sterilization. However, recent experiments [1] on the sterilizing of milk cans by steam show that about 3 minutes' contact with steam under pressure is required for effective sterilization.

The handling of water coolers in coach yards where sanitary conditions are unsatisfactory exposes them to contamination, and unless the steaming of these coolers is carried on in a manner to give effective sterilization it would certainly be far preferable to do away with this practice. That the railroads operating out of Chicago were attempting to carry out the Federal requirements was quite apparent, but, in conscientiously attempting to comply, the employees were in many cases unconsciously exposing the coolers to unnecessary pollution. In some of the coach yards it appeared that the practice used in steaming coolers involved a high and unnecessary labor expense, a waste of effort and money that is not necessary.

Steam is usually available in coach yards during the winter months. In the summer, frequently only special lines are so supplied. In coach yards, steam for sterilizing coolers is usually obtained from the yard steam line laid underground. Not infrequently the Pullman Co. employees use a portable boiler, heated by petroleum, for supplying steam for sterilizing their coolers. (See Pl. IV, A.)

In some of the railroad coach yards the practice of steaming water coolers is open to severe criticism from a sanitary as well as an economic standpoint. Unless some special steaming device or table has been constructed to which the coolers are brought for sterilization, they are usually steamed by inserting in them a short air hose attached to a coupling of the steam line. As the steam lines are under ground, the hose, being short and rigid, lies on the ground and is thus exposed to the filth so common to coach yards. Moreover, in order to insert the short hose, it is necessary to hold the cooler near the ground. In many cases noted the cooler was actually laid on the ground, and in a few instances, it was shoved along by the workman with his foot (See Pl. IV, B). For full protection, water coolers must be kept off the ground, and parts of equipment which lie on the ground must be kept out of them entirely. The end of an air hose coupling is made of heavy steel and is irregular in form. It would therefore be very likely to pick up from the ground filth

[1] "The sterilization of empty milk cans by steam under pressure." By A. T. R. Mattic. Jour. of Hgy., vol. 20, No. 21, October, 1921, pp. 165–172.

which could not be easily seen nor readily removed. Steam lines similar to those just described were seen lying in fecal deposits on two occasions during my visits to the 13 Chicago coach yards.

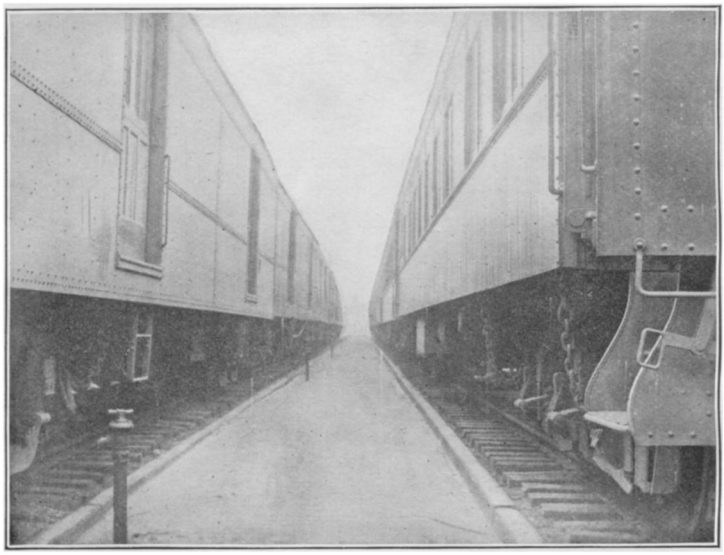
In two of the yards visited tables with a steam pipe projecting vertically about 18 inches above the top were being used. The coolers were either carried to the steaming table singly or several were brought to it in trucks at one time. The commendable feature of the steam table is that the coolers are kept off the ground and the steam line is not exposed to pollution. In a third coach yard a steaming device was arranged on a truck and attached to the steam couplings at convenient places in the yard (see Pl. V, A). At still another yard of the "terminal" type, steam pipes for sterilization of water coolers were located at the end of alternate pairs of tracks, a 3-foot riser with a "gooseneck" bend making it possible to sterilize the coolers without laying them on the ground. In the Big Four coach yard at Cincinnati, Ohio, a hot-water pipe and steam pipe are installed side by side over a drain so that the cooler, after having been steamed, can be rinsed with little loss of time and labor.

It is believed that the steam table is a most practicable arrangement. There are, of course, objections by safety engineers to the use of fixed structures above ground in railroad yards. These could be easily overcome by constructing a table on a truck body so that it could be removed from the yards when not in use. Furthermore, such an arrangement would save the time used in carrying coolers long distances to a stationary steaming table, for the portable steam table could be hauled to the nearest steam coupling in the part of the yard where it is needed and there connected. The use of trucks for carrying coolers to and from steaming stations in coach yards, it seems, would be more economical than carrying one cooler at a time, and for sanitary reasons would be much more satisfactory.

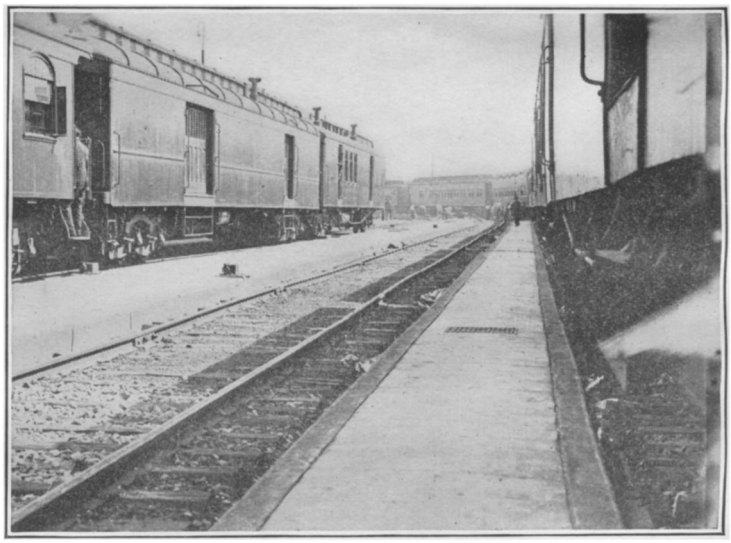
The handling of ice used for cooling drinking water is an important public health matter, especially since many of the coolers are not equipped as yet with separate compartments for ice and water. Ice is usually purchased in carload lots and unloaded in the coach yards directly onto a truck, on which it is washed and transported about the yard. For delivery to the coolers, the ice is broken into conveniently sized pieces and carried into the cars in pails. Where low, flat trucks are used, frequently the bottom of the ice cake will not be well washed. Also, during the process of chopping the ice, large pieces often slip off the trucks onto the platform or the ground, where they are quite likely to be contaminated by filth. When such accidents occur, the piece of ice is often picked up, put into the pail unwashed, and chopped in pieces for delivery to the coolers (see Pl. V, B). Such a practice is, of course, most insanitary, while the chopping of ice in pails is an expensive procedure, as the pick

A. Section of "through" coach yard with plank walks. When steam lines are laid under these wooden walks, rats nest under them in winter. Note that hydrants are so located that pollution by toilet wastes from cars is possible.

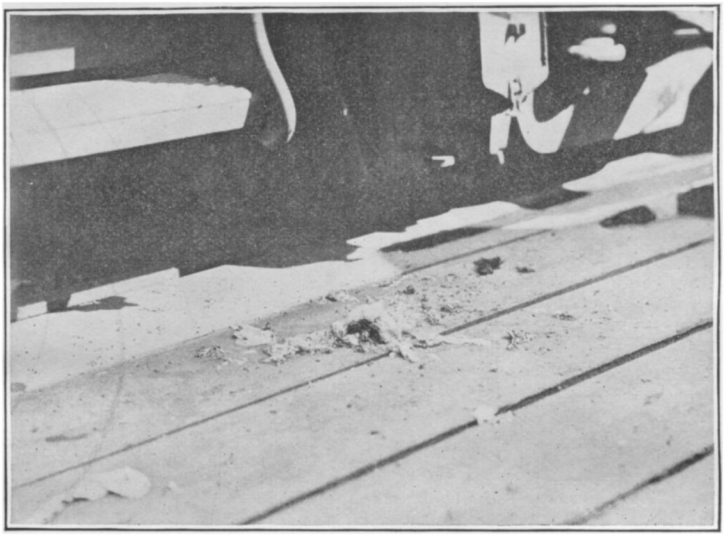
B. End walk of "terminal" coach yard. Steam and hot and cold water are available at track terminals. This is an exceptionally clean coach yard.



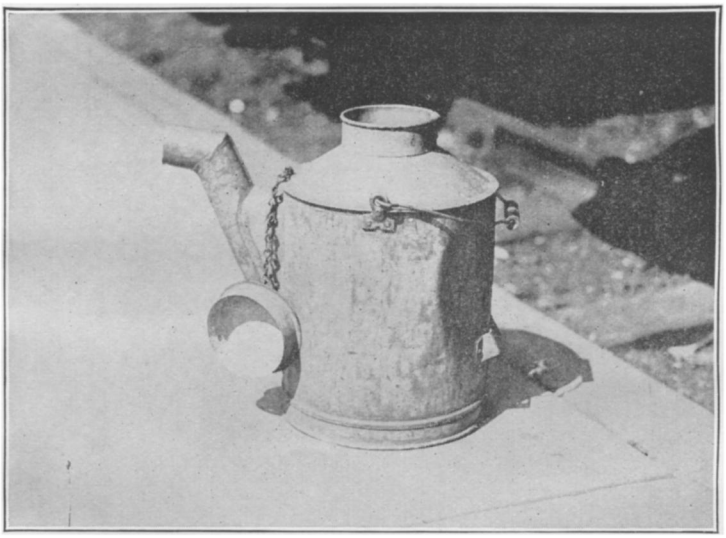
A. Brick walk between tracks in coach yard, with concrete gutters for draining water used in washing cars. Note location, spacing, and height of hydrants.



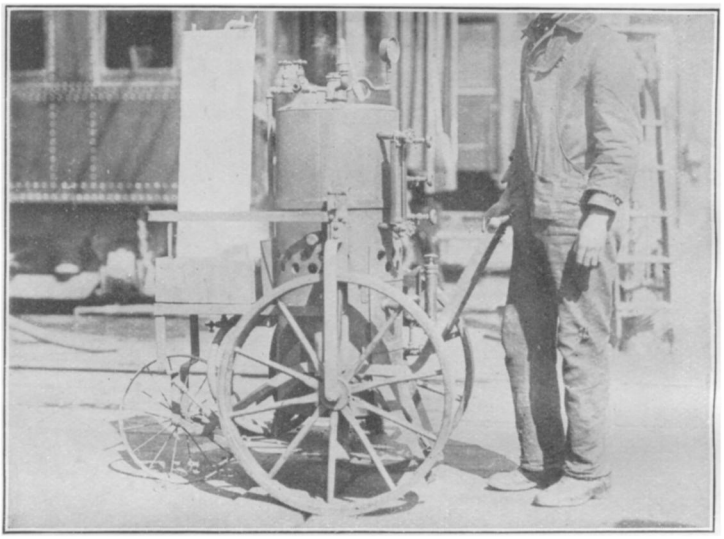
B. Section of coach yard, showing concrete walks and drain gutters. Note hose lying on walk in the distance.



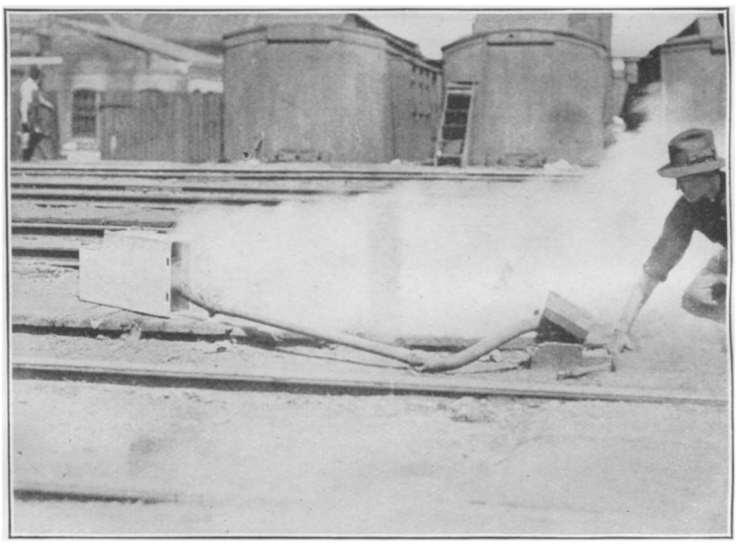
A. Fecal matter and paper dropped from toilet of car. Such pollution is altogether too frequent in railroad coach yards.



B. Water pail with protected nozzle and cover used for filling water coolers. A pail of excellent design.



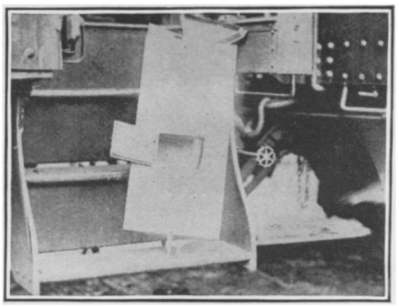
A. Portable boiler and steam sterilizer used by the Pullman company. Note inverted water cooler in position for steaming.



B. A common method used in coach yards for "sterilizing" water coolers by steam. When not in use the hose lies on the ground exposed to filth. Coolers are frequently contaminated by such practices.

A. A portable steam sterilizing truck used in the C., M. & St. P. coach yard in Chicago.

B.



C.

B. Washed ice being transported on a flat truck. In chopping the ice, pieces frequently fall to the ground and are put into coolers without being rewashed.
C. Water cooler, showing separate openings for filling ice and water compartments.

is quite likely to puncture the pail. Wooden false bottoms are used in many of the coach yards to protect the pails.

Where separate ice and water compartments are provided for coolers, the danger of contamination by the ice will be reduced. In two of the yards a special concrete platform about 10 feet square, sloping to a center drain is used for washing ice. The ice cake is turned over by tongs so it can be washed on all sides. In the New York, Chicago & St. Louis coach yard the practice in handling ice was especially commendable. The ice is stored in a special ice house with heavy insulated walls. The truck used in transporting the cakes of ice is a deep one with sloping ends. The ice is hauled to the steaming table, where it is first steamed all over and then rinsed. The steaming process melts the surface rapidly of course, but it removes small pieces of dirt and filth embedded in the ice, which ordinary rinsing could not do. The truck is then washed and the clean ice returned to it, chopped in the truck as needed, and carried in iron pails to the coolers. The truck being deep, the chopped ice does not easily slip off to the ground.

The work of icing coolers is at best not an agreeable or comfortable occupation, and is, therefore, likely to be neglected. Where coach and dining-car coolers are filled from overhead, the work is very laborious. At the Pennsylvania coach yards, where all coolers are filled overhead, it was reported that except at higher wage prices it was difficult to keep laborers on this work.

In connection with the icing of separate compartment water coolers, careful attention must be given in order to prevent ice from being put into the water compartment also. Upon investigation, ice was found in many cases in both compartments. Old coolers, remodeled to conform with the Interstate Quarantine Regulations, by being partitioned or given a separate compartment, must be iced with care. No less care should be exercised in handling the ice, even though separate compartments are provided. It is believed that separate openings should be provided for filling ice and water compartments in coolers (see Pl. V, C). In line with this idea, the Pullman company has adopted as standard practice the use of water coil and ice chamber devices in their coolers.

The cost of supplying ice is no small item to the railroads, and, therefore, care in handling and storing it is necessary for economical reasons. In summer, the ice stored in roof tanks melts rapidly, which fact, coupled with the extra cost of filling such tanks, is a matter that car designers might well consider. The building of specially insulated, walled ice houses at big coach yards is also an economical feature well worth investigating.

In observing and studying conditions and practices obtaining in the 13 Chicago coach yards and others in terminal cities of the Middle

West, with reference to the handling of drinking water, the possibility and practicability of standardizing this feature of "railroading" and public health was considered. The value of standardization became more and more convincing as the many and widely different practices by which these simple procedures were being carried out were noted. In discussing this matter with yard and coach foremen, these men were invariably of the opinion that standardization would be of value. It is believed that railroad and health officials could well come together and discuss the matter of standardization of coach yard design and practice with mutual value to each.

THE U. S. PUBLIC HEALTH SERVICE ADVISORY COMMITTEE ON OFFICIAL WATER STANDARDS.

For the purpose of administration of the Interstate Quarantine Regulations of the United States as they relate to drinking water supplied on cars and vessels of common carriers, a bacteriological standard for such waters was recommended by a commission of sanitary experts and promulgated by the Secretary of the Treasury on October 21, 1914. With reference to this, the following extracts are quoted from pages 268–269 of the Annual Report of the United States Public Health Service, 1915:

"Owing to the impossibility of determining the source and the conditions under which the water is gathered, greater reliance than is ordinarily justified must be placed upon bacteriological findings. * * * The recommendations (bacteriological standard) * * * are in no sense a standard for municipalities, neither do they indicate the ideal potable water * * *. The standard is based solely on the results of laboratory examinations and does not include sanitary surveys of watersheds, and the enumeration of undesirable or dangerous conditions thereon, a procedure which is of the greatest value. With the various physical properties, mineral constituents, and chemical impurities the standard as adopted does not deal. This is a matter which has been left for future consideration."

Since the adoption of this standard, facilities have been developed in State health departments for obtaining information as to "the source and conditions under which the water is gathered"; so that at present, certificates for interstate carrier waters are received regularly from every State in the Union and the District of Columbia, with the exception of Nevada and Colorado. Despite the intention of the commission which recommended the standard, and no doubt in view of the extension of the supervision of interstate carrier waters to include over 3,000 supplies in all parts of the country (almost 2,000 of which are public supplies), the Treasury Department Standard for Drinking Water for Interstate Carriers has been applied to many